Technical information for the 2023 Marine protected areas environmental trend and condition report card

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Acknowledgement of Country

We acknowledge and respect the Traditional Custodians whose ancestral lands we live and work upon and we pay our respects to their Elders past and present. We acknowledge and respect their deep spiritual connection and the relationship that Aboriginal and Torres Strait Islanders people have to Country. We also pay our respects to the cultural authority of Aboriginal and Torres Strait Islander people and their nations in South Australia, as well as those across Australia.

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Summary

The 2023 release of South Australia's environmental trend and condition report cards summarises our understanding of the current condition of the South Australian environment, and how it is changing over time.

This document describes the indicators, information sources, analysis methods and results used to develop this report and the associated 2023 Marine protected areas report card. The reliability of information sources used in the report card is also described.

The Marine protected areas report card sits within the report card Biodiversity theme and Coastal and marine sub-theme. Report cards are published by the Department for Environment and Water and can be accessed at www.environment.sa.gov.au.

1   Introduction

1.1   Environmental trend and condition reporting in SA

The Minister for Climate, Environment and Water under the *Landscape South Australia Act 2019* is required to 'monitor, evaluate and audit the state and condition of the State's natural resources, coasts and seas; and to report on the state and condition of the State's natural resources, coasts and seas' (9(1(a-b)). Environmental trend and condition report cards are produced as the primary means for the Minister to undertake this reporting. Trend and condition report cards are also a key input into the State of the Environment Report for South Australia, which must be prepared under the *Environment Protection Act 1993*. This Act states that the State of the Environment Report must:

- include an assessment of the condition of the major environmental resources of South Australia (112(3(a))), and

- include a specific assessment of the state of the River Murray, especially taking into account the Objectives for a Healthy River Murray under the *River Murray Act 2003* (112(3(ab))), and

- identify significant trends in environmental quality based on an analysis of indicators of environmental quality (112(3(b))).

1.2   Purpose and benefits of SA's trend and condition report cards

South Australia's environmental trend and condition report cards focus on the state's priority environmental assets and the pressures that impact on these assets. The report cards present information on trend, condition, and information reliability in a succinct visual summary.

The full suite of report cards captures patterns in trend and condition, generally at a state scale, and gives insight to changes in a particular asset over time. They also highlight gaps in our knowledge on priority assets that prevent us from assessing trend and condition and might impede our ability to make evidence-based decisions.

Although both trend and condition are considered important, the report cards give particular emphasis to trend. Trend shows how the environment has responded to past drivers, decisions, and actions, and is what we seek to influence through future decisions and actions.

The benefits of trend and condition report cards include to:

- provide insight into our environment by tracking its change over time

- interpret complex information in a simple and accessible format

- provide a transparent and open evidence base for decision-making

- provide consistent messages on the trend and condition of the environment in South Australia

- highlight critical knowledge gaps in our understanding of South Australia's environment

- support alignment of environmental reporting, ensuring we 'do once, use many times'.

Environmental trend and condition report cards are designed to align with and inform state of the environment reporting at both the South Australian and national level. The format, design and accessibly of the report cards has been reviewed and improved with each release.

1.3 Marine parks – global perspective

The marine environment regulates our climate, supports regional tourism, commercial and recreational fishing, aquaculture and shipping, and has significant cultural value for indigenous people.

Globally, the marine environment faces a number of pressures including: population growth, coastal pollution and development, overfishing, habitat modification, mining exploration, pest species, climate change and human–animal interactions/disturbance. The consequences of these pressures include the destruction of marine habitats, excessive extraction of marine resources, and a loss of marine biodiversity.

In 2016, it was reported that between 2.18–3.27% of the Earth's seas were protected by marine protected areas. However, less than half of this (about 1% of global waters, or about 16% of the marine protected areas) was considered to be highly protected by "marine reserves" or "no take zones" (Boonzaier and Pauly 2016, O'Leary et al. 2016). In 2017, the United Nations reported that marine protected areas had increased to 5.3% of global waters (United Nations 2017). Current literature states that 2.4% of global waters are classified as "highly protected" or "no take" (Marine Conservation Institute 2023). Partially protected areas can lead to larger populations and biomass of target and non-target species when compared to unprotected areas. However, greater benefits are apparent in highly protected "no take" areas when compared to partially protected areas (Sciberras et al. 2013).

The United Nation's Convention on the Biological Diversity Coverage Target for marine protected areas was ≥10% by 2020. In 2014, the World Parks Congress recommended increasing this to ≥30%. A review of 144 articles indicated that an average of 37% of the sea is required to be protected in order to achieve or maximise the objectives expected of marine protected areas (Objectives: to protect biodiversity, ensure connectivity, avoid collapse, avoid adverse evolution and maintain fishery value and stakeholder satisfaction). More objectives are met when protection exceeds 50% (O'Leary et al. 2016).

1.4 South Australian marine parks

In 2012, the Government of South Australia implemented a network of 19 marine parks which covered around 26,673 square kilometres (or 44%) of the state's waters and 267 square kilometres of coastal land and islands. The marine parks contain different zones which have differing levels of restrictions, ranging from General Managed Use Zones (GMUZ) – lowest level of restriction, through to Habitat Protection Zones (HPZ), Sanctuary Zones (SZ) and Restricted Access Zones (RAZ) – highest level of restriction. Sanctuary Zones and Restricted Access Zones comprise around 6.2% of state waters. The management plans for South Australia's marine park network were authorised in November 2012, with the primary objective of providing for biodiversity conservation while also enabling public appreciation and ecologically sustainable development and use of marine resources. Fishing restrictions in sanctuary zones were implemented on 1 October 2014.

Historical knowledge of the 19 South Australian marine parks is provided in the marine park baseline reports (e.g. Bryars et al. 2017a). These reports present predictions and indicators of change based upon the relationship between six inter-related components: (1) marine park management plans, (2) ecological values, (3) social and economic (socio-economic) values, (4) external physical drivers, (5) external socio-economic drivers, and (6) human-mediated pressures.

Ongoing monitoring is used to measure the effectiveness of each management plan in achieving the objects of the *Marine Parks Act 2007*. The Monitoring, Evaluation and Reporting (MER) Program developed six key evaluation questions (KEQ) that are directly related to the objects of the Marine Parks Act (Bryars et al. 2017b). These KEQs provide clarity about the priorities for monitoring and guide how the marine parks program should be evaluated. Each KEQ addresses specific outcomes and strategies in the context of effectiveness, impact, appropriateness and efficiency of the marine parks program. To inform the KEQs, *specific evaluation questions* (SEQs) have been developed.

The SEQs that are used to assess environmental/ecological outcomes include:

1. What biodiversity and habitats are included within the marine parks network?
2. Have sanctuary zones maintained or enhanced biodiversity?
3. Have habitat protection zones maintained biodiversity and habitats?
4. Have sanctuary zones maintained or enhanced ecological processes?
5. Have sanctuary zones enhanced ecosystem resilience?

Data to assess abundance, biomass, biodiversity and ecological processes are collected from priority sanctuary zones and marine parks. Currently, an assessment of ecological change from the monitoring program is not yet available as ecological change takes a number of years before it can be observed. In the interim, this report card reports on the spatial status of protection as well as some of the management strategies in place to ensure our marine parks effectiveness. More detailed ecological assessments are anticipated for future reporting.

2 Methods

2.1 Indicators

The indicators considered in the marine protected areas report card are: the area of state waters protected, and the status of protection and management actions.

2.2 Data sources and collection

Information on the area of marine protection is obtained through Enterprise Geographical Information System (EGIS) mapping using the **StateMarineParkNW_Zoning** State Marine Park zoning layers.

General marine park information and reference to ecological monitoring comes from the 'South Australia's 5-year status report' (DEWNR 2017). Compliance data are obtained through DEW compliance records collected by regional marine parks staff. Field surveys are conducted by DEWNR staff as part of the ongoing MER program (unpublished data). Surveys are conducted using Baited Remote Underwater Video Systems and Underwater Diver Surveys. For further detail see (Brook et al. 2017, Miller et al. 2017, DEWNR 2017, DEW 2019).

2.3 Data analysis

2.3.1 Trend

There are no data for a trend analysis presented in this report card. This card uses the status of the spatial area of the marine parks over time to report on trend. For most species, ecological data collected by the marine parks program cannot yet be used to assess ecological changes in marine park sanctuary zones. This is due to the significant timeframe expected before ecological changes can be observed (>10 years), as biological systems take considerable time to recover. A thorough assessment of ecological data will be conducted in the 10 year review anticipated to be completed at the end of 2023.

2.3.2 Condition

Condition for this report card is based on the generalised notion that marine parks have been established, management plans implemented, zoning is stable, and that ecological data are being collected to make future assessments of the condition of these marine areas.

2.3.3 Reliability

Information is scored for reliability based on the minimum of subjective scores (1 [worst] to 5 [best]) given for information currency, applicability, and level of spatial representation. Definitions guiding the application of these scores are provided in Table 2.1 for currency, Table 2.2 for applicability and Table 2.3 for spatial representation.

Table 2.1. **Guides for applying information currency**

Currency score	Criteria
1	Most recent information >10 years old
2	Most recent information up to 10 years old
3	Most recent information up to 7 years old
4	Most recent information up to 5 years old
5	Most recent information up to 3 years old

Table 2.2. **Guides for applying information applicability**

Applicability score	Criteria
1	Data are based on expert opinion of the measure
2	All data based on indirect indicators of the measure
3	Most data based on indirect indicators of the measure
4	Most data based on direct indicators of the measure
5	All data based on direct indicators of the measure

Table 2.3. **Guides for applying spatial representation of information (sampling design)**

Spatial score	Criteria
1	From an area that represents less than 5% the spatial distribution of the asset within the region/state or spatial representation unknown
2	From an area that represents less than 25% the spatial distribution of the asset within the region/state
3	From an area that represents less than half the spatial distribution of the asset within the region/state
4	From across the whole region/state (or whole distribution of asset within the region/state) using a sampling design that is not stratified
5	From across the whole region/state (or whole distribution of asset within the region/state) using a stratified sampling design

2.4 Data transparency

Data transparency for this report card is represented in Appendix A.

3 Results

3.1 Area of marine protected areas

Changes have occurred in the South Australian Marine Parks Network. Table 3.1 presents the changes that have been implemented to marine parks boundaries and zoning since 2020. Table 3.2 presents the area that marine parks protect and the areas that have changed since marine parks were fully implemented in 2014. Figure 3.1 shows the current boundaries for SA marine parks. For more detailed maps see individual management plans found at https://www.marineparks.sa.gov.au/.
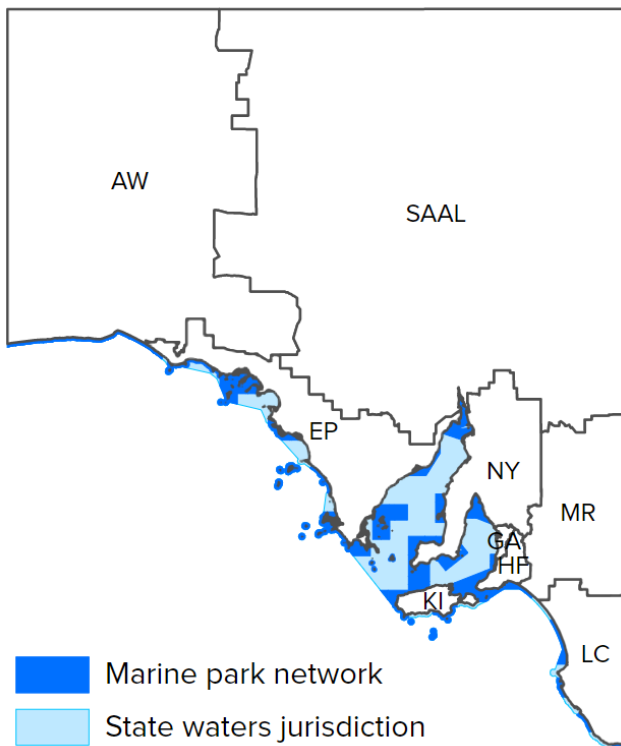

Figure 3.1. Current boundaries for SA marine parks

Changes to marine parks since 2020 included: extensions of marine park outer boundaries to incorporate shellfish reefs at Windara and Glenelg, and a new sanctuary zone at Port Stanvac; increasing the size of Nuyts Reef Sanctuary Zone; providing an additional fishing area in the Clinton Wetlands Sanctuary Zone; decreases in the size of the Cape du Couedic and North Neptune Islands sanctuary zones; providing a special purpose area for shore-based recreational line fishing in the Coorong Beach South Sanctuary Zone; and providing a special purpose area for commercial abalone fishing in the Isles of St Francis Sanctuary Zone.

The overall area of marine parks increased from 26,673 km^2 (44.3% of the state's waters) to 27,031 km^2 (44.8% of the state's waters).

Table 3.1 Summary of most changes to the original South Australian marine parks boundaries and zoning since 2020

Marine Park	Sanctuary Zone affected	Amendment
Nuyts Archipelago Marine Park	Nuyts Reef	Increase in the size of Nuyts Reef Sanctuary Zone
	St Francis Island	Creation of a Special Purpose Area to allow for commercial abalone fishing in the north-east region of the sanctuary zone
Neptune Islands Group (Ron and Valerie Taylor) Marine Park	North Neptune Islands	Change in North Neptune Islands Sanctuary Zone from coverage of the entire North Neptune Island and surrounds to covering the north-east of North Neptune Island and extending to the outer boundaries of the marine park
Upper Gulf St. Vincent	Windara Reef	Extension of outer boundaries of marine park to incorporate Windara reef
	Clinton Wetlands	The additional of a second shore-based recreational fishing special purpose area within the Clinton Wetlands Sanctuary Zone
	Windara Reef	Creation of the Windara Reef Sanctuary zone with a special purpose zone that allows for recreational fishing
Western Kangaroo Island Marine Park	Cape du Couedic	Decrease in the size of Cape du Couedic Sanctuary Zone
Upper South East Marine Park	Coorong Beach South	Addition of a special purpose area for shore- based recreational line fishing within the Coorong Beach South Sanctuary Zone
Encounter Marine Park		Extension of the Encounter Marine Park outer boundaries to incorporate the new metropolitan shellfish reef at Glenelg and the new Port Stanvac Sanctuary Zone
	Port Stanvac	Habitat protection zone for the Metropolitan shellfish reef at Glenelg
		Addition of Port Stanvac Sanctuary Zone

Table 3.2.   Changes to the total area and percentage of marine park per protection zone types in South Australia between 2014–2020 and 2022

Zone type	2014–2020 Total area (km²)	2014–2020 Percentage of total marine park (%)	2014–2020 Percentage of State waters (%)	2022 Total area (km²)	2022 Percentage of total marine park (%)	2022 Percentage of State waters (%)
General managed use zone	8,184	30.7	13.6	8,246	30.5	13.7
Habitat protection zone	14,862	55.7	24.7	15,026	55.6	24.9
Sanctuary zone	2,938	11.0	4.9	3,069	11.3	5.1
Restricted access zone	689	2.6	1.1	*690	2.6	1.1
Total	26,673	100	44.3	27,031	100	44.8

*Note: Minor difference between area calculations between years. No changes to restricted access zones have occurred since 2012.

3.2   Reliability

The overall reliability score for this report card is 5 out of 5, based on definitions in Section 2.3.3 and Table 3.3. This is considered to be 'Excellent' reliability.

Table 3.3.   Information reliability scores for marine protected areas

Indicator	Applicability	Currency	Spatial	Reliability
Area and status of marine parks	5	5	5	5

3.2.1   Notes on reliability

The status of marine protection is measured directly by the area that is protected across the entire marine park network to 2022. Therefore, applicability, currency and spatial parameters are all given a score of 5.

4   Discussion

4.1   Trend

The level of protection and spatial area of the marine environment included inside marine parks is stable. The South Australian marine park network has been established since 2012 (although sanctuary zones weren't implemented until October 2014). The network remained unchanged until 2020 when a review process was undertaken and some minor adjustments were made to the boundaries and zoning as described in Section 3. As the spatial changes were considered to be minor relative to the overall scale of the marine parks network, and there were some losses and some gains for sanctuary zone protection, the trend was assessed as stable. The marine parks network has been implemented for 10 years and a legislated 10-year review will be undertaken in 2023. The 10-year review will assess the effectiveness of marine park management and zoning, and inform future management strategies.

Data to address specific evaluation questions related to ecological monitoring of marine parks (see questions listed in introduction) are still being collected. Ecological change usually requires a number of years before it becomes measurable. Sanctuary zones were only fully implemented in 2014 giving eight years of data as of 2022. The rate at which ecological change will be detectable by marine parks monitoring will vary depending on the region and the species of fish and invertebrates most common within the sanctuary zones. There are some indications of change from specific studies that indicate that marine park sanctuary zones are effective. For example, southern rock lobster in the Cape du Couedic Sanctuary Zone have responded with greater catch rates being observed in protected areas when compared to areas outside the sanctuary zone (McLeay et al. 2017). Trends in ecological change can be used to inform the development of future reporting when an adequate amount of information is available.

4.2   Condition

Edgar et al. (2014) considered there to be five essential characteristics of an effective marine protected area. The area should be a no take zone, be well enforced (compliance), be established for greater than 10 years, cover a large area of greater than 100 km^2, and be isolated by geological features such as deep water or sand. Marine protected areas that meet four or five of these categories tend to contain greater fish biomass, more large fish greater than 250 mm, and greater biomass of apex predators like sharks. Marine protected areas with only one or two essential characteristics tend to be indistinguishable from unprotected and fished sites (Edgar et al. 2014).

As discussed in Section 4.1, the South Australian marine parks network was only fully implemented in 2014, making it difficult to assess the effectiveness of the network. Until long-term data on aspects of ecological condition such as biodiversity, fish size, abundance and biomass are available, reporting on the condition of habitats and species within the marine parks will not be possible with any degree of certainty.

Therefore, the current "good" condition given for this report card is based on the status of marine parks protection, management activities (e.g. compliance) being undertaken, and the MER Program. The '5-year status report' released in 2018 indicates that marine parks are protecting and conserving South Australia's marine life for future generations and are on track to meet the objectives and outcomes outlined in the objects of the *Marine Parks Act 2007*, the marine parks management plans, and the baseline reports (Bryars et al. 2017b, DEWNR 2017).

5   Appendices

A.   Managing environmental knowledge chart for Marine protected areas
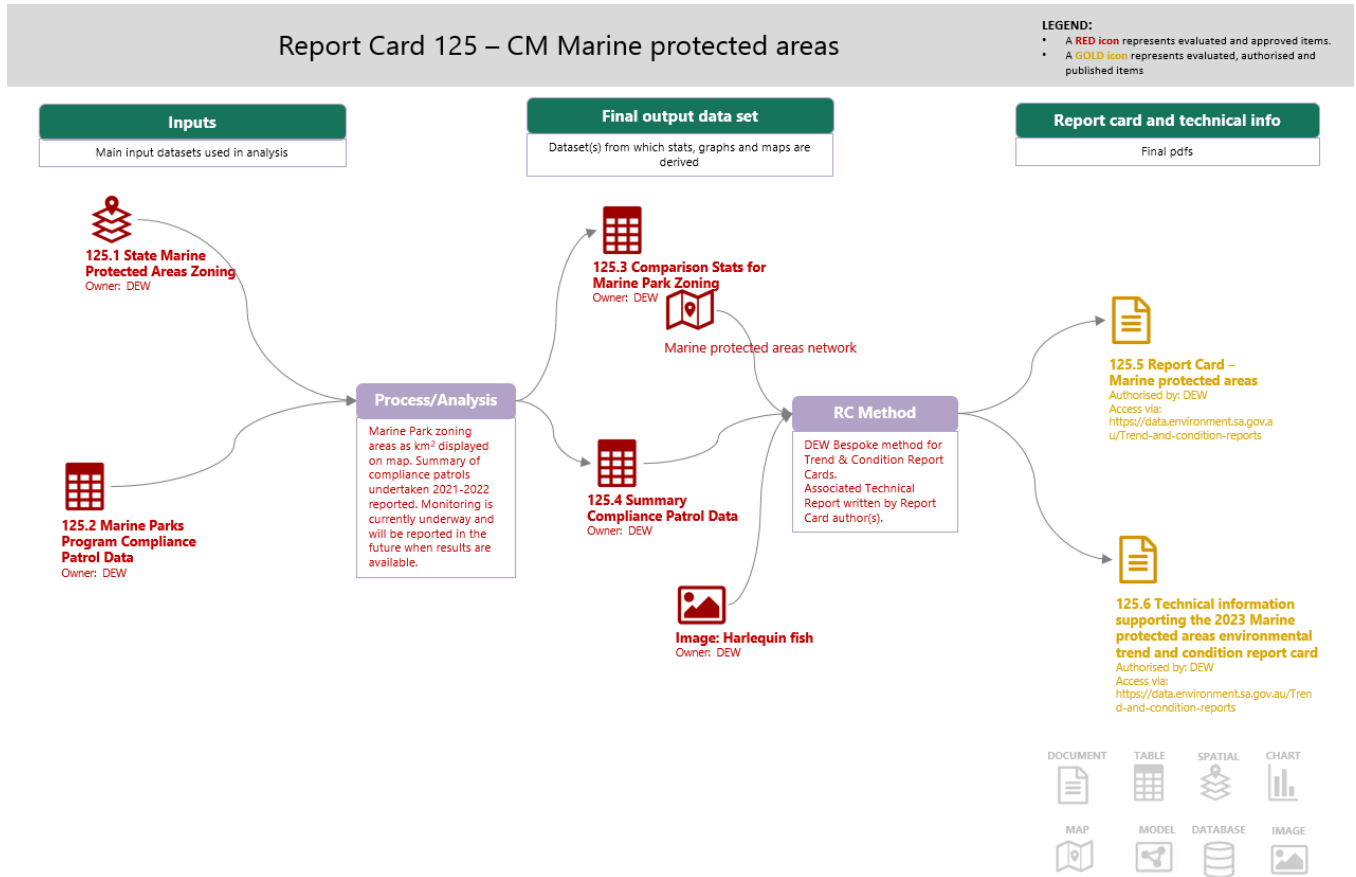
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